A Study of Prelatent, Latent and Iron Deficiency Anemia in Pregnant Mothers and their Importance

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Abstract
Background: *Anemia in pregnancy continues to be a major public health problem in the world despite decades of proposed solutions, women in developing countries are still suffering the effects of having to go through a pregnancy in an anemic state.*
Hence this study was conducted to assess the prevalence of anemia its latent and pre latent among the pregnant women in our geographical area.
Methods: *The patients age, parity,pregnancy interval,socioeconomic status etc of 100 patients (50 anemic + 50 controls) were noted and blood was collected for blood investigations which included Hb,Hemogram,serum ferritin,serum iron,TIBC,% of transferrin saturation*
Results: *The predominant age group of the 100 patients was 21-25 years. Mean Hb of anemic group is 6.9 gm% compared to 11.9 gm% in controls. The serum iron in anemic group was 48.12 ug/dl as against 100ug/dl in control group.The mean TIBC in anemic group is 431ug/dl compared to 332 ug/dl in control.The mean transfferin satuartion in anemic group is 11.16% as against 31% in controls.*
In the control group 25% were found to have transferrin saturation < 25% which is abnormal and 10% cases with transfferin saturation < 16% thus identifying latent form of anemia in pregnancy i.e., who will develop Anemia in the weeks or months following diagnosis.
Keywords: *Anemia, fetal outcome,Hb,pregnancy,s.iron,TIBC,Transferrin saturation.*

I.   Introduction

Iron deficiency anemia is universal in occurrence irrespective of country, age, sex etc. With its higher incidence in areas of low socio-economic and low nutritional status areas of developing countries.

Anaemia begins in childhood, worsens during adolescence in girls and gets aggravated during pregnancy. Surveys conducted in India have shown that70% of the preschool children were anemic and so were over 70% of the pregnant women and adolescent girls in the country.

Around 14% of the pregnant women in the developed countries and 55% in the developing countries are affected, with 65-75% seen among the pregnant women in the Indian subcontinent.

Iron and folic acid deficiency were the major factors responsible for anemia in pregnancy. It is attributed to 1.Poor economic status, 2.Lack of hygiene, 3.Improper inadequate diet, 4.Early Marriage, 5.Child bearing in rapid succession, 6.Wide spread parasitic infestation, 7.Malaria, 8.Tropical mal absorption syndrome, 9.Insufficient maternity services, 10.Illiteracy.

Anemia complicating pregnancy puts it in high risk category as it leads to Increase in maternal morbidity,Increase in material mortality,Increase in premature delivery,Increase in low birth weight babies,Increases in perinatal deaths.

Anemia was responsible for 20% of maternal death and was contributory causes for another 20%. The routine investigations like H.b%, peripheral smear along with the clinical assessment helps to detect over iron deficiency anemia but not the latent and the prelatent forms, where iron stores gets depleted with ineffective erythropoiesis.

So only the tip of the iceberg is seen in our routine practice with the usual investigations as the latent and the prelatent forms from the major proportion of the phenomena – ''iron deficiency in pregnancy''.

So the need for the other tests which detect iron deficiency earlier like serum iron, total iron binding capacity , transferring % of saturation, Serum ferritin is mandatory to know the real extent of the problem in that particular area under study.

OBJECTIVE OF MY STUDY

Fifty women with haemoglobin less than 11 gms. % as cases and fifty women with haemoglobin more than 11gms % in 3rd trimester of pregnancy as control are selected and studied on various aspects of iron deficiency anemia during 10 months period.

VARIOUS ASPECTS THAT ARE STRESSED ARE :

* Relationship between iron deficiency and its various causes – like socio-economic status parity, pregnancy interval, lactation, antenatal checkups and worm infestation etc.
* Various biochemical parameters used for diagnosis of iron deficiency and their reliability like – serum iron, Total Iron binding capacity, transferrin saturation.
* The haematological and bio chemical correlation in various degrees of anemia.
* Methods for identification of latent iron deficiency even though the HB is greater than 11gms. Percent.
* To find out the various complications of labour.
* Regarding maternal morbidity &mortality.
* Finally the foetal outcome like weight of the baby, perinatal mortality etc.

II. Materials

A total of 100 pregnant women in 3rd trimester of pregnancy were selected from our outpatient and labour wards, such that 50 of these have haemoglobin less than 11gms%.

INVESTIGATIONS DONE

1. HB in gm% estimated by sahlis method.
2. Peripheral smear examination done by preparing a smear and staining it with leishman's stain.
3. serum iron TIBC % of transferrin saturation (Mean Values)
4. Serum iron in relation to HB level:
5. Serum iron level in each group:
6. T.I.B.C & Hb levels:

III. Method

The smear is examined first under low power which helps to detect parasites and help to select area for the study of red cell morphology and a drop of oil is then placed on the slide and is examined under the oil immersion lens.

Size of RBC noted, normal size (between 6.7 and 7.8 u) are normocytes. Smaller cells (<6 u) are microcytes and larger cells (> 9 u) are macrocytes. A vide variation in size of the cells is referred to as anisocytosis.

Shape of RBC examined. Normal shape is biconcave. Variation in shape is called plikilocytosis. Spherical cells are spherocytes.

The biochemical parameters serum iron and TIBC are estimated by ferrozine method. Reagent kit is available for in vitro determination of serum iron and TIBC.

Estimation of serum iron & TIBC:-
Principle

Serum proteins are precipitated with a reagent containing hydrochloric acid (to dissociates iron) theoglycolic acid (to reduce iron to ferrous states) and trichloroacetic acid (to precipitate proteins). The iron in ferrous states reacts with chromogen , to give pink coloured complex which is measured coloimetrically.

For T.I.B.C. determination, serum is treated with iron standard to saturate binding sites and excess of iron is removed by absorption on magnesium carbonate. The iron content of the serum is a measure of total binding capacity. A serum of 4ml. Is required for estimation of both. This method is simple and reproducible. Kit contains sufficient reagents Protein precipitant, Chromogen, Magnesium carbonate (light) and Stock iron standard 100mg%.

IV. Procedure

For calorimeter
Step A – Saturation of sample with iron (only for TIBC).
Step B – deproteinisation of test samples (for both iron & (TIBC)).
Step C – colour development (for estimation of both iron & (TIBC)).
For spectrophotometer: All the volumes used for colorimetric procedure is halved. Rest of the procedure remains unchanged. Measure the O.D. at 570 mm

Calculation:

Serum Iron in μg/100 ml   =   O.D. Test (T1) – O.D. empty blank

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O.D. std – O.D. empty blank x 200

Serum TIBC in μg/100 ml   =   O.D. Test (T2) – O.D. empty blank x 400

O.D. std – O.D. empty blank

Transferrin saturation percentage is calculated as Serum Iron / TIBC x 100

V. Results

In our study, 50 pregnant women in the third trimester with haemoglobin levels less than 11gm percent are taken as study group or anemia group. Control group consists of 50 pregnant women in third trimester with their haemoglobin level more than 11gm %.

• Hb gm % less than 11gm % is to considered as anemia in pregnancy.

The anemia group is further divided into three sub divisions (as Mild, moderate and severe anemia depending on the level of Hb%) This classification is done as there is a marked difference in the outcome of pregnancy between these 3 groups.

ANEMIA				Normal	total
	severe	Moderate	Mild		
Hb	< 5 gm%	5-8 gm%	8-11 gm%	> 11 gm%	
No. Of preg. Anemia women	7	28	15	-	50
%	7%	28%	15%	50%	
Control	-	-	-	50	50

Various factors responsible for iron deficiency and their incidence in various groups.

Some of the factors which are considered in this study are:

1)AGE: In the present study, the observations are

Age in years	In Anemic group under study	%	Control Group	%
< 20	11	22	5	10
20-25	32	64	40	80
26-29	6	12	5	10
> 30	1	2	0	-

The highest rate of incidence of anemia is seen in the age group of 20-25 yrs(32 out of 50)→64%. Even in the control group the pregent women mostly (80%) are of this age group.

The incidence of anemia is less than 20yrs of age may be of significance as they form 22% of anemic group. While in normal control group with Hb>11gm%,only 10% are of <20yrs of age.

There is no other significant difference in then age distribution.

2.Gravidae & parity:-

	Anemic Group	% Anemic group	Control group	% Control group
G1	15	30	30	60%
G2(P1 L1)	24	48	20	40%
G3(P2 L2)	11	22		
TOTAL	**50**		**50**	

In the above table, we find 30% of women have no children, 48% with 1 child and 22% with 2 children in Anemic group.

We find increase in the incidence of anemia from G1 to G2 i.e, 30 to 48% significant to show that no of children will lead to increased incidence of anemia. While comparing the incidence in G2 and G3.We found decrease from 48% to 22%.This is due to lower number of people going for third pregrency showing the awareness of family planning in the study population. In this difference can be made out if we compare the control and anemic group with 22% &Nil persons respectively in G3 division.

Suggesting that incidence of anemia is more in the multiaparous women.

The other way of representing this is : Total no. of people under study =100

Stastics with regard to gravidae in subdivisions of anemic group are:

Gravidae	Severe anemia		Moderate anemia		Mild anemia	
	No	%	No	%	No	%
G1	2	28.57	7	25	6	40
G2	3	42.86	14	50	7	46.67
G3	2	28.5	7	25	2	13.33

By comparing primi of three groups and likewise G2 G3 of 3 groups we find that the % of multiparous pregnant women with anemia is decreasing as we move from severe to mild degree of anemia.

3) Interval between pregnancies :
The findings obtained are statistically displayed as :

HB in gm%	No. Of cases	Interval <2yrs	%	Interval >2yrs	%
<5gm	5	4	80	1	20
5-8gm	21	12	57.14	9	42.85
8-11gm	9	3	33.33	6	66.66
Mean	35	19	54.28	16	45.71
>11gm	20	5	25	15	75

In the anemic group, 54.28% are having children with birth interval less than 2yrs. When compared to control group where only 25% are having birth interval less than 2yrs. When the % is compared between mild moderate and sever cases, most of the severe 80% are having spacing less than 2yrs.The percentage decreases with moderate to 57.15% and still further with mild anemia i.e, 33.33%.
In the above mentioned figures signify the importance of birth spacing on the haemoglobin status of the mother.
Lack of birth spacing is commonly seen in developing countries. Already poor iron store due to improper nutritive diet gets exhausted by recurrent pregnancies with no time replenishment of stores in between pregnancies and further increasing the demand of iron.

4) Duration of lactation:

Number of years of breast feeding					
	>2yrs	%	<2yrs	%34.28	Total
Anemic	23	65.75	15	34.28	35
Control	7	35	13	65	20

In the above figures of lactation >2yrs was found in 65.71% is anemic. People with corresponding value of 35% in a healthy pregnant women.
In India, a pregnant women tends to continue breast feed till the birth of next child leading to doublefold increased demand for iron in present pregnancy for both lactation and increased demand of the pregnancy, leading to ncrease incidence and severity of anemia.
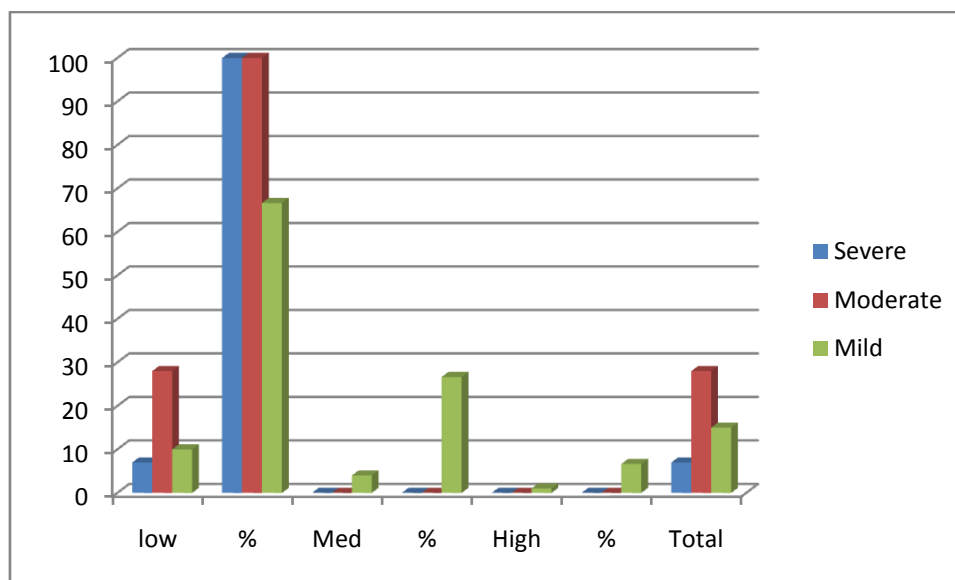
5) Socio economic status:
Most of the people who come for check up to our hospital are of low socio economic group. Rarely people of medium or high socio economic status do come.

People in anemic group	Low socio economic	%	medium	%	High	%
50	45	90	4	8	1	2
Control						
50	-		30	60	20	40

People in anemic group, who are of medium or high socio economic status belong to division of mild anemia – otherwise,it can be represented as

SOCIO ECONOMIC STATUS:

	low	%	Med	%	High	%	Total
Severe	7	100	Nil	-	Nil	-	7
Moderate	28	100	Nil	-	Nil	-	28
Mild	10	66.66	4	26.66	1	6.66	15

6) Hook worm infestation:
Of the 50 in anemic group 23 people were found to have hook worm infestation and all are of low socio economic status mostly belonging to moderate and severe anemia divisions.

Total		Hook worm		% of +ve
		+ve	-ve	
Anemic	50	23	27	46
Severe	7	5	2	71.42
Moderate	28	15	13	53.57
Mild	15	3	12	20
Control	50	7	43	15

The above figure show increased incidence of hookworm infestations in anemia group(15%)
The rate of infestation also increases with the increases in severity of anemia.this finding may show that the rate of illiteracy, lack of hygiene, poor knowledge about nutrition during pregnancy which inturn lead to both i.e., hookworm infestation and anemia.

7) *Influence of regular antenatal checkups on anemia in pregnancy*

Group	No	3 or more antenatal checkups before 3rd trimester	%	Irregular & <3	%
Anemia	50	6	12%	44%	88%
Control	50	50	100%	Nil	Nil

Sub divisions			
Anemia	>3	<3	% of <3
Severe	Nil	7	100%
Moderate	Nil	28	100%
Mild	6	9	60%

In our study we found nearly 88% of anemic with no antenatal checkups. The corresponding figure in control group – is nil.
When the same is taken for different grades of anemia we find that this to be (100%) in severe and moderate degree of anemia while 60% in mild degree of anemia.
In our study – 7 to 8 time risk (6 compared to 44) With no prophylactic iron therapy and antenantal checkups.

8) *Patients on oral iron since 2nd trimester.*
        The statistics are almost the same of that of regular antenatal checkups. This implies that people of mild anemia of about 40% are having regular antental checkups and were on oral iron therapy and they have mostly Hb around 10gm% .The rest of women belonging to anemic group are not having either regular antenatal checkups or oral iron.
Iron prophylaxis, Hb at booking, race, previous history of anemia in earlier pregnancy are important predictors of anemia at delivery.
So all the above factors are interrelated.

SYMPTOMS OF THE ANEMIC GROUP
Tabulations of observations

	Anemic	%	Control	%
Generalised weak ness & body pains	25	(50%)	10	(20%)
Breathlessness On exertion +palpitation	20	(40%)	-	
Oedema feet	23	(46%)	2	(4%)
Puffiness in face & generalised oedema	1	(2%)	-	
Burning micturition	1	(2%)	-	
Symptoms of pre eclamptic toxaemia	4	(8%)	-	
Asymptommatic	9	(18%)	38	(75%)

Most of the people in anemic group presented with generalised weakness & body pains – 50% compared to 20% in control group.
- Breathlessness & palpitation at work in 40% of cases and with oedema feet – in 46% of cases due to hypoprotenemia & anoxia.
- Signs of generalised oedema is seen in a patient with CHF and burning micturition in 2% of cases.
- 18% of these anemic group were asymptomatic mostly belonging to mild grade of anemia with Hb > 9gm%
- In 8% of case signs of preeclamptic toxaemia were made out.

Investigations done and their inferences:
1.   Hb in gm% and its relation to degree of anemia:

Anemic :< 11 gm %	No of cases	%	Mean HB%	Mean Hb % in Anemic & Control group
a) < 5 gm %	7	14 %	3.885	
b) 5-8 gm%	28	56%	6.5	6.980
c) 8-11gm%	15	30%	9.31	(3-10.8)
Control: >11 gm %	50		11.59	11.59

The mean haemoglobin value in anemic group is 6.98% gm% while that of control group being 11.59gm%.
While studying in different grade of anemia, the values were 3.885,6.5,9.31 for severe, moderate and mild grades of anemia.
The values are seen decreasing as the severity of anemia is increasing.

2)Haemogram analysis:

Mean values of	Hb	RBC	PVC	MVC	MCH	MCHC
1)Total anemic Sub-groups:	6.98	3.05	23.9	76.77	22.59	28.08
Severe	3.885	1.74	15.43	77.27	19.54	25.34
Moderete	6.5	2.95	22.5	76.63	22.582	28.288
Mild	9.31	3.87	31	76.87	24.2	29.2
2) Control	11.59	4.28	37.6	86.6	27.27	33

Showing the decreasing value of RBC, PCV, MCV, MCH, & MCHC as the degree of anemia increases and when compared with control.

Peripheral smear:

	Microcytic hypochromic	%	Normocitic Hypochromic	%	Normocytic Normochromic	%	Dimorphc anemia	%
Control	-	-	20	100	-	-	-	-
Anemic	20	40	16	32	10	20	4	8
<5 gm%	3	42.85	3	42.85	0	-	1	4
5-8 gm%	16	57.14	10	35.71	1	3.57	1	3.5
8-11gm%	1	6.66	3	20	9	60	2	3.3

In 40% of cases of anemic pregnant women pure iron deficiency anemia of microcytic hypochromic picture is seen mostly from severe and moderate anemic groups.

Normocytic hypochromic blood picture in 32% of case and normocytic normochromic in 20 % cases mostly from mild anemic group.

Macrocytic blood pictures with hypochroimia was seen in 8% of cases. it was due to combined folate and iron deficiency.

Wide spread anisocytosis, poikilocytosis and even polychromasia were noted. The different blood pictures pointout that exact deficiency of iron could not be made out depending on this especially mild, latent and prelatent forms of iron deficiency anemia as less severe iron deficiency anemia during pregnancy is usually

not accompanied by obvious morphological changes in the circulating erythrocytes – (Williams)

3) *SERUM IRON, TIBC, % OF TRANFERRIN SATURATION (Mean values):*

	S. iron	TIBC	% Transferrin saturartion
Control	99.3	308	32.24
Anemic	50.0	401	12.00
Sub groups:			
Severe	25	508.5	5.00
Moderate	47.88	424.64	11.30
Mild	68.4	410.00	16.60

a)   Serum iron in relation to hb level:

	HB	S .Iron
Control	>11 gm	99.3
	8-11	68.4
Anemic	5-8	47.8
	< 5	25

The value of mean serum iron in mcg% are found to decrease as Hb levels are decreasing. In the anemic group it is 50 compared to 99.3 in control group.

b)   levels of serum iron in each group:

HB levels in gm%									
S. iron	**8-11**	**(%)**	**5-8**	**(%)**	**< 5**	**(%)**	**Total**	**%**	**Control**	**%**
< 50 mg/d1	3	(2)	21	(75)	7	(100)	31	(62)	-	-
51-84 mg/d1	10	(66.6)	5	(17.85)	-	-	15	(30)	4	(20)
> 85 mg1d1	2	(13.33)	2	(7.14)	-	-	4	(8)	16	(80)

By the above study we found that serum iron levels were 100% below 50µg/d1 in severally anemic group with 75% and 20% in moderate and mild cases.
The mean % of people (in anemic group) with serum iron < 50 µg/d1 are 62% with nil in control group.
In the same people the serum iron levels of 50-85 and >85µg/d1 are noted and found an increase in percentage of anemic women with higher levels of serum iron as the severity of anemia decreases.

S. iron levels	Anemic group	Control group
51-84µg	30%	20%
>85µg	8%	80%

Above data indicates higher values of s.iron in control group compared to anemic group.

c)   T.I.B.C.& Hb levels

Hb in g%	TBIC µg/d1	% of saturation
<5	508.5	5.0
5-8	424.64	11.3
8-11	410.66	16.65
Mean (anemic group)	432	12.0
Control		
>11	308	32.24

The TIBC of anemic group was 432µg/d1 compared to 308µg/d1 in control group.
With the incrrease in severity of anemia, we found increased TIBC.
At Hb levels < 5 it is 508.5, decreasing to 424.64 at 5-8 gm/d1 and further decreasing to 410.66 at 8-11 gm/d1 of Hb.
The saturation of transferrin denotes the percentage of transferrin to which iron was bound.The values are 12% in anemic group compared to 32.24% in control group.
In the anemic group lowest level of 5% was found in severely anemic, with 11.3% and 16.65% in moderate and mild anemic groups.
If in the presence of normal Hb levels >11%, the serum transferrin saturatrion is <16, then it is identified as latent iron deficiency. such 5 cases were found in our study (i.e.10%).
If the Hb level > 11g %, peripheral smear is showing normocytic normochromic picture and % of saturation of transferrin is < 25% of pregnant women with normal Hb levels are in latent phase of iron deficiency.
The S.I, TIBC, % saturation of transferrin will help in identifying there cases.
They are not of much help in overt disease which can be diagnosed with the help of Hb% and peripheral smear.
-Nearly 25% of people were seen first time in labour with 71% of several anemic group.

*Mode of delivery:*There are higher number of blood transfusion and packed cell transfusions in severe anemic group, IM injections in moderate, oral iron in mild anemic group.

Out come :
Fetal out come :
The most common complications we have encountered were
1. Preterm deliveries
2. Low birth weight babies
3. Increased perinatal mortality

Preterm deliverie :

Data collected are:	No. of preterm	%
Control	2	4%
Anemic group	9	18%
sub groups:		
Hb		
< 5gm	3	42.85%
5 – 8	5	28.71%
8 – 11	1	6.66%

In the control group with Hb > 11 gm %, 4% of preterm delivery was obtained which is normal. While comparing that of anemic group (18%) 3 - 4 fold increases is noted.
In the several anemic group it is nearly 8 – 9 fold increase.
And in the moderately anemic group there is 4-5 fold increase when compared to control.
In mild anemic group, there is no significant increase in incidence of preterm deliveries.
So incidence of preterm deliveries increased with the severity of anemia.

L.B.W Babies:
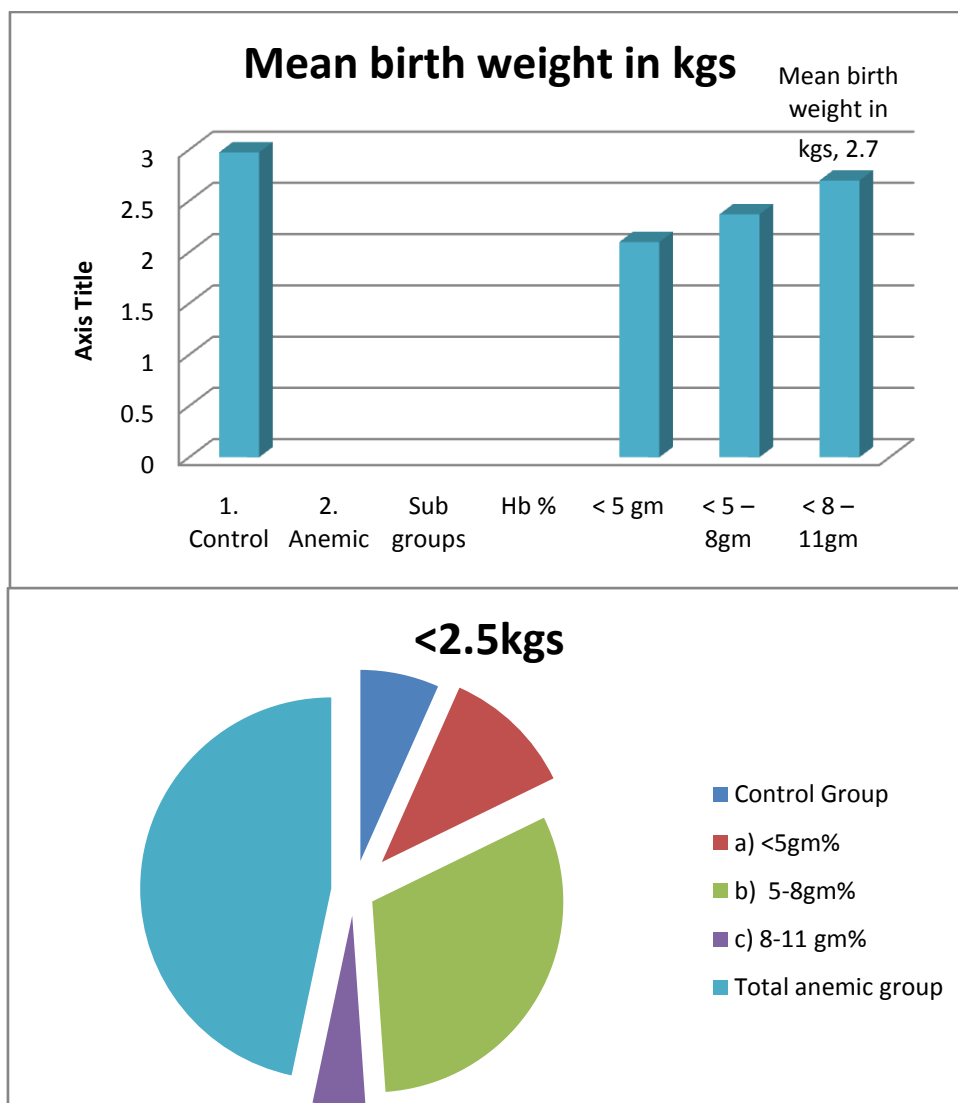The mean birth weight in anemic and control group are,

	Mean birth weight in kgs
1. Control	2.975
2. Anemic	
Sub groups	
Hb %	
< 5 gm	2.1
< 5 – 8gm	2.37
< 8 – 11gm	2.7

While comparing the birth weight in different groups. We found grossly low birth weight babies in severely anemic group – 1.9kgs and 2.3kg in moderate anemic and 2.7kgs in mild anemia.
Signifying that as the severity of anemia increases the birth weight also decreases .which may in turn reflect IUGR and preterm deliveries together.
As most of the study group have no prophylactic iron therapy from 2nd trimester due to lack of antenatal checkups, it resulted in low birth weight babies.
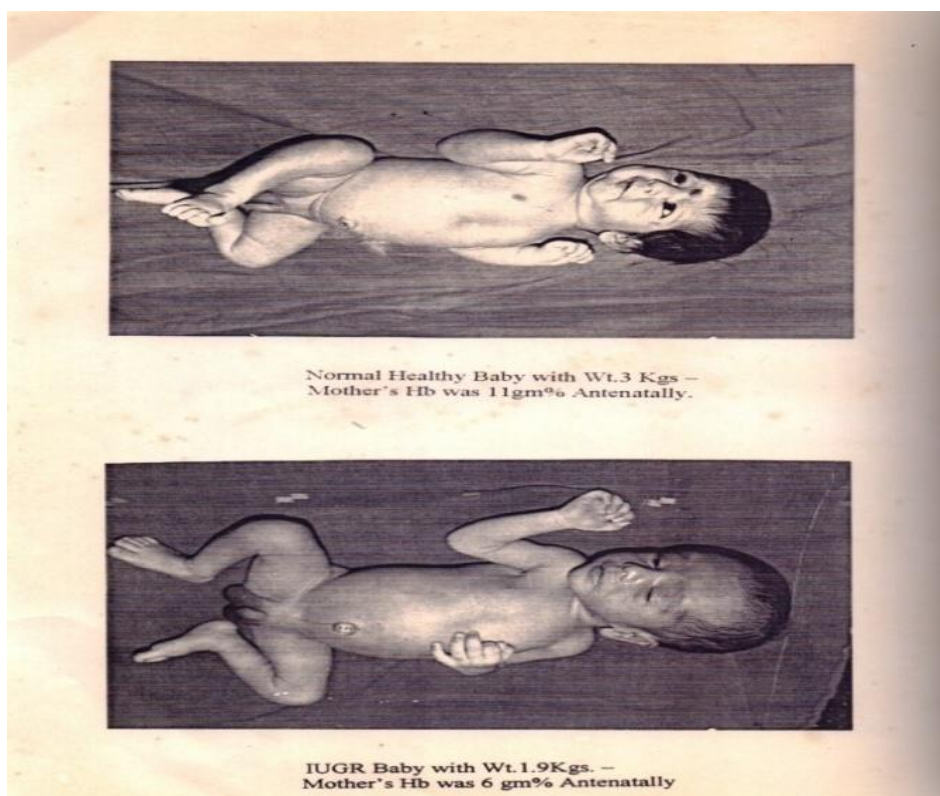
Mean birth weight in kgs

Mean birth weight in kgs, 2.7

(bar chart with Axis Title from 0 to 3; categories: 1. Control, 2. Anemic, Sub groups, Hb %, < 5 gm, < 5 – 8gm, < 8 – 11gm)

<2.5kgs

(pie chart)

- Control Group
- a) <5gm%
- b) 5-8gm%
- c) 8-11 gm%
- Total anemic group

A baby is said to be of low birth weight if it is <2.5kgs. So comparing the Birth weight of babies in each groups we had the following statistics.

	<2.5kgs	>2.5kgs	%<2.5 kgs
Control Group	3	47	6%
a) <5gm%	5	2	71.4%
b) 5-8gm%	14	14	50%
c) 8-11 gm%	2	13	13.33%
Total anemic group	21	29	42%

In the above data, 6 % of low birth weight babies were in control group –i.e., within normal limit of general population. With increasing severity if anemia, the percentage of babies born with less than 2.5kg increased from 13.33% for mild, 50% for moderate to 71.4% in severe anemic group signifying the relation between the two.

Normal Healthy Baby with Wt.3 Kgs –
Mother's Hb was 11gm% Antenatally.

IUGR Baby with Wt.1.9 Kgs. –
Mother's Hb was 6 gm% Antenatally

*Perinatal mortality***:**
Data obtained from our study are:

Cases resulted in perinatal mortality		
	No	%
Control (>11gm%)	Nil	Nil
Anemic Hb <5gm	3 out of 7	42.85%
5 - 8g	4 out of 28	14%
8 - 11 gm	Nil	Nil

We found increasing incidence perinatal mortality as Hb levels tend to fall from 8gm% i.e; 14% in 5 – 8gm% of Hb compared to 42.85% in < 5gm % of Hb.

It is said to be increased 2 – 3 fold if Hb levels is < 8gm% and 8 – 10 fold if Hb level is < 5 gm%.

Maternal morbidity &mortality:
Various complications that were seen during the study period in anemic group are:

	NO.	%
Uneventful	36	72%
CHF	2	4% (1 in intrernal period (at 32 weeks). 1 in labour)
Puerperal sepsis	2	4%
Signs of preeclampsia	4	8%
Urinary tract infection	1	2%
PPH	3	6%
Sorethroat & URI	2	4%
Total	50	
Maternal morality	0	

The degree of maternal morbidity varied with the degree of anemia particularity CHF etc; are seen only when Hb is < 5gm%. Maternal morbidity increases only when Hb is < 8 gm% and show a steep rise when Hb is < 5gm%.
This may be due to smaller study group and lower number in severe anemic group (only 7) taken for study irrespective of medical care available.

VI. Summary

1. 64% Of anemic patients are in the age group of 21 – 25 years. It might be due to it being the highest fertile period of life.
2. There is increase in the incidence of anemic pregnant women as the partiy increases. Around 55% of primigravide are anemic in our study when compared to 75% of second gravidae being anemic and so forth.
3. 54.28% of anemic women have pregnancy interval of < 2 years when compared to 75% of control who have more than 2 years of spacing.
4. 65.71% of anemic women located for > 2 years compared to 62.5 of controls who located for < 2 years.
5. 90% of anemic women are of low socio-economic status, compared to control group who belong to either medium or high socio-economic group.
6. 46% of anemic women are having hookworms infestation compared to 15% of control.
7. Irregular or no antenatal checkups with nil iron prophylaxis was seen in 88% of antenatal anemic group.
8. Anemia may be asymptomatic or may present with number of symptoms – non-specific or specific. Commonest are: generalized weakness, decreased work capacity , breathlessness, palpitations, oedema etc.
9. The routine tests Hb and heamogram show changes only late in iron deficiency anemia and he picture may be normal in case of latent and prelatent forms.
10. The typical microcytic hypochromic picture is seen in only 40% of anemic cases.
11. The mean Hb of anemic group is 6.9gm% compared to 11.59% in control group.
12. There exists prelatent i.e, with defective iron stores and latent with defective erythropoiesis which can be identified by

a) Abnormal S.ferritin for prelatent form
b) Abnormal S. Iron ,TBIC ,% of transferrin saturation in latent from along with ferritin levels.
13. The serum iron, TIBC and transferrin saturation correlated well with the severity of anemia.
- The mean serum iron in anemic group is – 48.12 μg/d1 as against 100 μg /d1 in control.
- The mean TIBC in anemic group is – 431 μg/d1 compared to 322 μg/d1 in controls.
- The mean transferrin saturation is 11.16% as against 31% in controls.
14. In control group, 12 cases (24%) are found to have transferrin saturation < 25% which is abnormal and 5 cases (10%) with transferrin saturation <16% which indicates definitely anemia.
15. The incidence of preterm delivery increased with severity of anemia. It is 6.6%, 28.7%, 42.85% in mild moderate and severe anemic cases.
16. The mean birth weight decreased with increasing severity of anemia. It ids 2.7 kg, 2.374 kg and 2.1 kg respectively in mild, moderate and severe anemia. In control group, it is 2.975 kgs.
17. The percentage of babies with< 2.5 kgs in anemic group is 42% compared to 5% in control group.
18. The preinatal mortality increased with increasing severity of anemia ranging from 42% in severe anemic to 14% in moderate aemic group.
19. There is 2 – 3 fold increase in perinatal mortality when Hb is < 8gm% and 6 – 7 fold increases when Hb is < 5gm%.
20. The maternal morbidity increase is found when Hb is < 8 gm%.
The maternal morbidity increased with increasing severity of anemia.

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